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OLDMAN RIVER DAM

1990 RAPTOR MITIGATION PROGRAM

A Report Prepared For:

GOVERNMENT OF THE PROVINCE OF ALBERTA

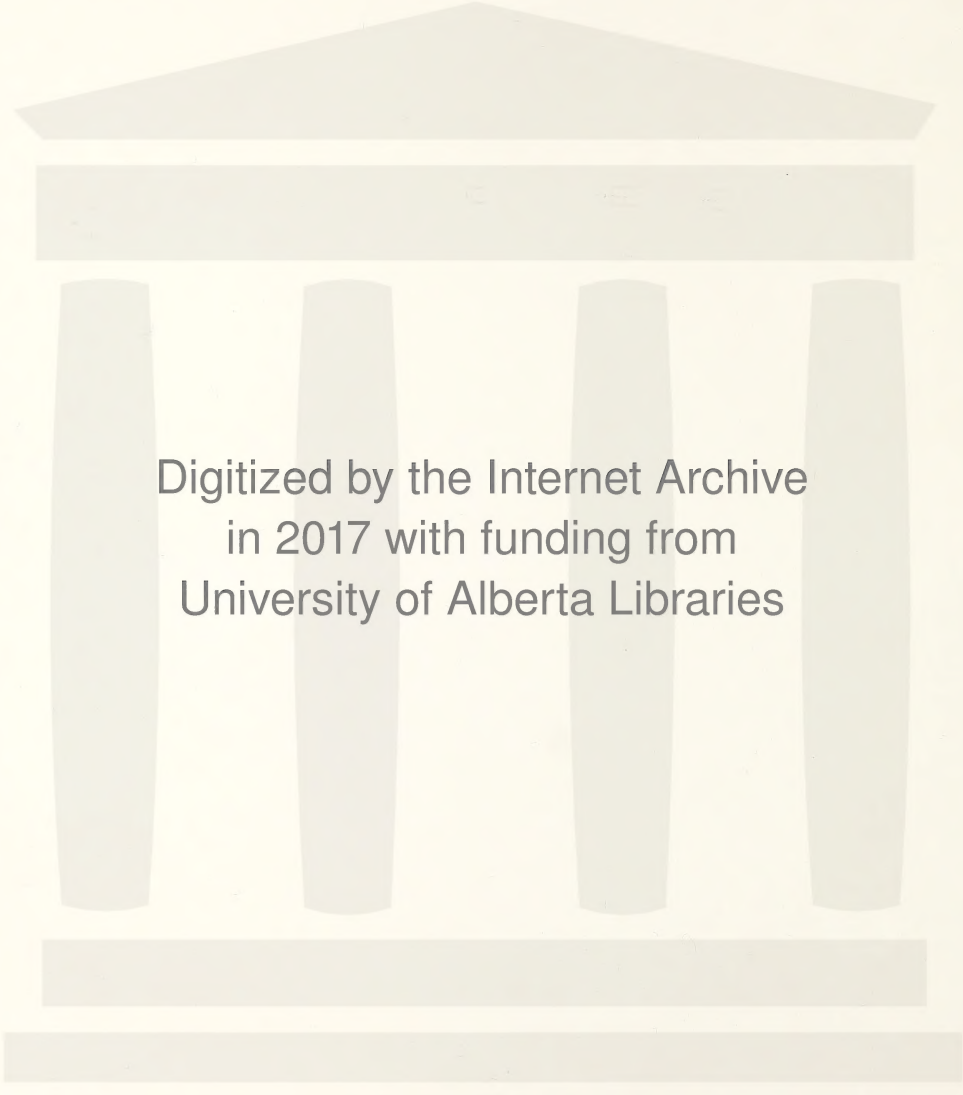
DEPARTMENT OF PUBLIC WORKS, SUPPLY AND SERVICES

Edmonton, Alberta

Prepared by

R.W. FYFE

DECEMBER 20, 1990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EXECUTIVE SUMMARY

This is the second report on the raptor mitigation carried out in association with the Oldman River Dam. The project was implemented in response to concerns relative to the welfare of two species of raptorial birds, the Prairie Falcons Falco mexicanus and Ferruginous Hawks Buteo regalis. Both species are present and nest in areas impacted by the construction and eventual flooding of the Oldman River Dam.

In the current year approximately 610 hours were spent in the field observing these birds. Seventeen Prairie Falcon and three Ferruginous Hawk breeding territories were located and monitored throughout the 1990 breeding season. Thirteen pair of falcons fledged fifty young and two pair of Ferruginous Hawks fledged five young. Nine adult and forty seven young Prairie Falcons were caught, individually banded and colour marked for future identification.

In the 1990 breeding season moderate to severe disturbance associated with construction related activities was documented at six of the falcon territories. Three desertions were recorded during current breeding season, however, none of these could be attributed to disturbance. Of the two sites which were believed deserted due to disturbance in 1989 one was occupied and fledged young in 1990. No birds were observed at the other site at any time during the breeding season. This site is located at the Dam itself

and it is possible that the intensive human activity may have precluded any nesting attempt.

Four artificial nest sites were selected and defended by Prairie Falcon pairs. One pair relocated twice and finally selected a very inferior natural nest site following conflict with an intruding male prairie falcon. One site was attended by a first year male who was unsuccessful in courting several females that approached his territory. The remaining two pair nested successfully. In addition to the falcons, artificial nest holes were utilized by Canada Geese(Branta canadensis) and Great Horned Owls (Bubo virginianus). Three additional nest sites were constructed this spring bringing the total to fifty nest sites available for falcons or other cliff nesting species. Thirty six of these were newly created or improved nest sites, the remaining fourteen are suitable natural nest sites. The majority of the artificial or improved sites have been located so as to serve either as alternate nest sites within existing territories or as alternate locations to provide nest sites for birds that may be forced from current territories by construction or flooding.

1.0 INTRODUCTION

BACKGROUND AND RATIONALE

This is the second year of a proposed five year project specifically designed to mitigate for breeding Prairie Falcons and Ferruginous Hawks that will be impacted by the construction and/or flooding of the Oldman River Dam. As outlined in the 1989 report the rationale remains unchanged. In order to understand the affects of construction and the subsequent flooding on this population of birds of prey, it is necessary to:

a) determine the annual breeding population of both species;

b) document where possible disturbance associated with construction of the dam and its affect on territorial pairs;

c) individually mark resident birds for future identification, specifically to determine movement and possible relocations associated with the construction and flooding of the dam;

d) document annual production prior to and subsequent to the completion of the dam.

Information compiled through 1990 indicates that the flooding of the Oldman River Dam will eliminate nine available nest sites and nesting habitat currently used by seven pair of Prairie Falcons and one site formerly occupied by one pair of Ferruginous Hawks. All of these pairs have nesting in, or adjacent to the area to be flooded by the completed Dam.

Since construction and flooding will displace breeding pairs of Prairie Falcon and Ferruginous Hawks we have implemented specific mitigation procedures designed to maintain and possibly enhance

these populations. The two principle limiting factors for any bird of prey are an adequate food supply and the availability of suitable nest sites. Our observations suggest that the dam will not adversely impact on the availability of prey, however, the availability of suitable nest sites has been a concern. Initial mitigation has therefore centred on providing suitable alternate nest sites in areas not currently occupied by territorial pairs of these two species. In addition, it is also recognized that for the long term welfare of these birds, it is both desirable and necessary to initiate and maintain good public relations.

2.0 OBJECTIVES

The principal objective of this project remains unchanged in that we are attempting to minimize possible adverse effects of the construction and subsequent flooding of the Oldman River Dam on the resident populations of Prairie Falcons and Ferruginous Hawks. To achieve this objective we have monitored the effects of disturbance on the two species and have implemented mitigation procedures which we believe will minimize the impact on these populations.

To achieve these objectives more specific objectives were described in the original contract #Fyfe 89-01 and are as follows:

a) To provide supervisory services relative to the construction of raptor nesting sites;

b) To supervise the tagging and identification of raptors during the year;

c) To maintain a photographic (slide) record of the project;

d) To observe and record the movement of raptors during the courtship period and over the summer, and;

e) To provide a report at the end of the year.

3.0 METHODS

3.1 FIELD OBSERVATIONS:

3.1.1 Inventory of Breeding Pairs

The first raptor inventories related specifically to the Oldman River Dam were carried out as part of the Oldman River Wildlife Investigations in the spring and summer of 1985. These inventories located four breeding pair of Prairie Falcons and one pair of Ferruginous Hawks within the proposed reservoir boundaries. Three additional pair of falcons and two pair of Ferruginous Hawks were located upstream and downstream of the proposed reservoir. (Young et al. March 86). Further inventories of breeding pairs within the proposed reservoir were carried out in 1986 and again in 1987. These inventories were somewhat cursory in that they were of short duration, their timing precluded the collection of data on the establishment of territories and the surveys were restricted to nests located within 1.6 km of construction related activity (Young, 1988).

A more comprehensive inventory was required in order to determine the total population, the affects of construction and flooding of the dam, and to locate potential alternate breeding locations. Therefore raptor breeding inventories and

behavioral studies were carried out from March thru July in 1989 and 1990. These field investigations were carried out specifically to locate breeding pairs, non breeding pairs and individuals occupying known breeding territories, or suitable nesting habitat within 16 km. of the proposed reservoir boundaries.

3.1.2 Banding and Colour Marking

In order to verify the effects of the construction and/or flooding of the dam on the resident Prairie Falcons and Ferruginous Hawks, it will be necessary to be able to distinguish residents from migrants or transients of the same species. Since most individuals of both species are virtually identical in size and colour, it is necessary to catch the individuals and mark them with an external marking device which can be identified later. Following considerable discussion we received permission from Alberta Fish and Wildlife Branch and from the Canadian Wildlife Service Banding Office to use standard numbered bands together with combinations of red, blue and black coloured bands on Prairie Falcons for the study area. Efforts will be concentrated on Prairie Falcons since they will be most directly affected by the construction and flooding. The single pair of Ferruginous Hawks identified in the area of the proposed reservoir have since relocated outside of the area and none of the Ferruginous pairs currently nesting in the study area will be

displaced by activities related to the construction and/or flooding of the dam.

3.1.3 Disturbance

One of the objectives of the current study is to determine the effects of the construction and flooding of the dam on both Prairie Falcons and Ferruginous Hawks. Earlier studies have documented adverse affects on these two species resulting from various types of disturbance (Fyfe and Olendorff 1976, Call 1978, White and Thurow 1985, Grier and Fyfe 1987). Since several of the Prairie Falcon and Ferruginous Hawk nesting territories encompass areas that are impacted by or adjacent to the dam it is inevitable that resident birds will be disturbed to a greater or lesser degree by activities associated with construction and/or flooding. Therefore for both the 1989 and 1990 breeding seasons, all observed instances of disturbance and the subsequent behaviour of the affected birds were documented.

Unfortunately concerns relative to disturbance will not disappear following the completion of the reservoir. We should be cognizant that following flooding of the reservoir, the majority of the breeding pairs of prairie falcons and several other species will be subjected to increased interaction with humans. This will certainly be true as a result of increased recreational activities. In light of the environmental

concern by the public and environmental groups it might be useful to capitalize on our accumulated data on this population of birds. In particular this background of data will present an excellent opportunity to evaluate the effects of disturbance in relation to increased recreational activities. Such monitoring would help to understand habituation and would contribute to realistic guidelines relative to the effect of recreational activities on these species.

3.1.4 Artificial Nest Construction

Current data indicate that a minimum of one Ferruginous and eight Prairie Falcon nesting territories will be adversely impacted as a result of dam construction and /or flooding. Following the flooding of the reservoir, seven pair of falcons will be displaced permanently since the nesting habitat previously utilized will no longer be available. It is expected that the remaining pair of falcons which formerly nested at the dam site will return to nest in its original territory following construction.

As in 1989 field observations and the excellent production in the current year suggest that foraging areas and the availability of an adequate prey base will not be limiting factors. Therefore in 1989 and again in 1990 we have concentrated our efforts on providing suitable nesting sites.

Following the 1989 breeding season an ambitious program of nest site construction and modification was undertaken in and adjacent to the proposed reservoir. For the most part, these sites are situated near existing territories and will not be directly impacted by the flooding of the reservoir. As a result of this mitigative action, I believe the availability of suitable nest sites should no longer a limiting factor. Consequently if and when any of these birds are displaced due to construction or flooding, alternate unused nesting sites are now available for occupancy.

4.0 RESULTS

4.1 POPULATION INVENTORY

Two Prairie Falcon nesting territories were documented for the first time and Prairie Falcons were observed in sixteen of seventeen documented nesting territories during the 1990 breeding season. Two of these were found to contain single males each with two females that occupied separate nest sites within the males territory. Three known territories were not occupied by pairs in 1990. At one a single female Prairie Falcon was observed in the area and a single yearling male was observed at another site during most of the breeding season. The territory located at the dam construction site is the only documented territory within the study area where falcons were not observed in the 1990 breeding season.

Ferruginous Hawks were located in three nesting territories outside of area of the proposed reservoir but within the study area. Two of these pair occupied territories identified the previous year, the third territory was newly recorded. Two additional pair were observed to the east of the study area. The pair which had been recorded near the feedlot in 1989 was not observed in that area during the current breeding season. It should also be noted that Ferruginous hawks have not been observed during either the 1989 or 1990 breeding seasons in the area of (Fer 17) as described by Young et al. (1986).

4.1.1 Prairie Falcon Production

Despite the very cold and wet spring fifty young Prairie Falcons were produced by thirteen productive pair (Table 1) for an average of 3.85 young per productive pair, or an average of 3.33 young for fifteen nesting attempts. Two territories were documented where single males mated with two females resulting in four nesting attempts, three of which fledged young. The fourth attempt was unsuccessful due to the desertion by the female during incubation.

4.1.2 Ferruginous Hawk Production

Five young were produced at two nest sites located well outside of the proposed reservoir. At both nests, all of the young had just fledged when we were able to visit the nests. The two light phased adults near the highway produced two light phase young whereas the new pair at the edge of the Porcupine Hills (a dark phase male and light phase female) produced three dark phase fledglings. The Porcupine Hill pair returned to use the same nest as last year and were observed courting, nest building, breeding and incubating. Unfortunately as in the previous year this pair deserted following an unusually heavy snow fall May 27th.

TABLE 1. PRAIRIE FALCON BREEDING TERRITORIES 1989,1990

NEST SITE	PRS		IND		COURT		COP		EGGS		YNG FL	
	89	90	89	90	89	90	89	90	89	90	88	90
Old Bridge	Y	Y			Y	Y						4
Mercury	Y	Y							4		4	3
Dam[1]	Y				Y							
Buffalo Jump E.	Y	Y			Y	Y	Y				4	5
Buffalo Jump W.[2]	Y	Y			Y	Y	Y	Y	3			
Fairbrother	Y	Y			Y				5		3	3
Bitango Eagle		Y			Y							4
Bitango Bridge	Y	Y			Y				Y		5	
Tennessee Creek		Y	Y									4
Lang	Y	Y					Y		3		1	5
Welsch	Y	Y			Y				4		4	4
Days	Y	Y					Y		5		2	
1st Porcupine[R]		Y			Y		Y					5
Double Ox-bow	Y			Y	Y							
Horseshoe Canyon	Y				Y		Y		5		4	4
Horseshoe Canyon[2]	Y										2	2
Maloof	Y	Y			Y		Y		4			3
Stevick			Y	Y								
Castle Dairy	Y	Y			Y		Y		5		4	4

[1] suspected relocation from former #42

[2] second nest site within an established territory

[R] pair relocated from Days

NEST SITE = Names given to known breeding territories

PRS = pairs observed on territory

IND = individual birds observed to remain in a territory

COURT = courtship behaviour observed

COP = copulation observed

EGGS = number observed, most nests not climbed in incubation

YNG FL = number of young known to have fledged

TABLE 2.
FERRUGINOUS HAWK BREEDING TERRITORIES
1989,1990

NEST SITE	PRS		IND		COURT		COP		EGGS		YNG FL	
	89	90	89	90	89	90	89	90	89	90	89	90
Feedlot	Y		Y				Y					
Highway	Y	Y									3	2
1st Porcupine	Y	Y			Y		Y					
Porcupine #2		Y										3

NEST SITE = Names given to known breeding territories

PRS = pairs observed on territory

IND = individual birds observed to remain in a territory

COURT = courtship behaviour observed

COP = copulation observed

EGGS = number observed, most nests not climbed in incubation

YNG FL = number of young known to have fledged

4.2 BANDING AND COLOUR MARKING

Six previously unbanded breeding adult birds and forty seven young Prairie Falcons were captured and colour marked (Table 3 and 4). A total of ninety seven Prairie Falcons have been banded and colour marked during the 1989 and 1990 seasons. This total includes nineteen adults caught and individually marked. As in 1989 all were banded with numbered USF&W bands and one or more coloured anodized aluminum bands. Young birds were banded with a single colour coded as to the year of production. Since the young will not be part of the breeding cohort prior to the flooding of the dam they are marked only so that at some later date it is possible to determine if recruitment is from this population unit.

The primary objective of the banding is to help us to locate and identify individuals that move or are displaced. However, since it is not always possible to catch the breeding birds, each adult bird that we have caught has been specifically colour marked so that individuals can be identified in the field by the use of a spotting scope. We were able to test this technique during the current year and five previously banded adult birds were identified by reading the band colour combinations. We were also able to catch and subsequently release three previously banded birds. The latter were examined closely and were found to have suffered no ill effects from the multiple bands. The bands were also examined and were found to be in excellent condition.

It was also proposed that Ferruginous Hawks nesting within the boundaries of the proposed reservoir will be individually marked beginning in 1990. Unfortunately none were banded as timing necessitated that our first efforts had to go to banding the prairies. At the same time no Ferruginous nested within the area to be flooded and the young at the two successful nests just outside of the area had fledged within a day or so of our attempts to catch them.

4.3 DISTURBANCE

It is safe to say that all of the breeding pairs of both species in the study area are subject to a wide range of natural disturbance and varying degrees of human related disturbance.

TABLE 3
ADULT PRAIRIE FALCON BANDING
1989 - 1990

LOCATION	MALES BANDED		FEMALES BANDED	
	LEFT	RIGHT	LEFT	RIGHT
Bitango Bridge			Red 5	987-85501 +sm.blue
Castle Dairy		816-80807 +sm.red		
Day	Black 3	816-80804 +sm.red		
Day (1st Porcupine)			987-23586	
Double Ox-Box			Black 4	987-85504
E. Buffalo Jump	Red 1	816-80801		
Fairbrothers	Black 2	816-80805 +sm.blue		
Fairbrothers			Black 5	987-85505 +sm.blue
Horseshoe Canyon			Red 16	987-85535
Lang	816-80848			
Lang			Blue 4	987-85502
Maloff	816-80802	Red 3		
Maloff			987-85548	Red 28
Mercury	Black 1	816-80806 +sm.red		
Mercury			Black 6	987-85506 +sm.red
Old Bridge			Red 15	987-85526
Tennessee Coulee			987-85549	Red 30
Welsch's	Blue 2	816-80803 +sm.blue		
Welsch's			Blue 5	987-85503 +sm. blue

TABLE 4
YOUNG PRAIRIE FALCON BANDING
1990

LOCATION	MALES BANDED		FEMALES BANDED	
	LEFT	RIGHT	LEFT	RIGHT
Lang	Red 55	816-80843		
Lang	Red 56	816-80844		
Lang	Red 57	816-80845		
Lang	Red 58	816-80846		
Lang			Red 25	987-85546
E. Buffalo Jump	sm.black	816-80823		
E. Buffalo Jump	sm.black	816-80824		
E. Buffalo Jump			sm.black	987-85523
E. Buffalo Jump			sm.black	987-85525
1st Porcupine	sm.black	816-80825		
1st Porcupine	sm.black	816-80826		
1st Porcupine	sm.black	816-80827		
1st Porcupine	sm.black	816-80828		
1st Porcupine	sm.black	816-80829		
Old Bridge	sm.black	816-80830		
Old Bridge			sm.black	987-85527
Old Bridge			sm.black	987-85528
Old Bridge			sm.black	987-85529
Tennessee Coulee	sm.black	816-80831		
Tennessee Coulee	sm.black	816-80832		
Tennessee Coulee	sma.black	816-80833		
Tennessee Coulee			sm.black	987-85530
Welsch	sm.black	816-80834		
Welsch	sm.black	816-80835		
Welsch			sm.black	987-85531
Welsch			sm.black	987-85532
Horseshoe Canyon	sm.black	816-80836		
Horseshoe Canyon	sm.black	816-80837		
Horseshoe Canyon			sm.black	987-85533
Horseshoe Canyon			sm.black	987-85534
Horseshoe CanyonB			sm.black	987-85536
Horseshoe CanyonB			sm.black	987-85537
Castle Dairy	sm.black	816-80838		
Castle Dairy	sm.black	816-80839		
Castle Dairy			sm.black	987-85538
Castle Dairy			sm.black	987-85539
Mercury	Red 52	816-80840		
Mercury	Red 53	816-80841		
Mercury			Red 19	987-85540
Maloff			Red 20	987-85541
Maloff			Red 21	987-85542
Maloff			Red 22	987-85543
Fairbrother	Red 54	816-80842		
Fairbrother			Red 23	987-85544
Fairbrother			Red 24	987-85545
Bitango Eagle	Red 59	816-80847		
Bitango Eagle			Red 26	987-85547

Earlier studies suggest that the Ferruginous Hawk is much less tolerant of human disturbance than the Prairie Falcon (White and Thurow 1985, Fyfe and Olendorff 1976).

TABLE 5. PRODUCTIVITY AND DISTURBANCE AT KNOWN FERRUGINOUS BREEDING TERRITORIES FOR 1990

NEST SITE	1985 NEST #	PRODUCTIVE IN 1990	DISTURBANCE
Feedlot		not occupied	Minimal
Highway		Y	Minimal
Porcupine Hill[1]	#47	N	Minimal
Porcupine #2		Y	Minimal

[1] suspected relocation from former #42

[2] second nest site within an established territory

[R] pair relocated from Days

NEST SITE = Names given to known breeding territories

= Corresponds to nest numbers given in earlier reports by Young

PRODUCTIVE = Indicates whether a nest site was productive or not in the 1990 breeding season.

DISTURBANCE = relative level of documented disturbance

Fortunately our observations during the 1989 and 1990 breeding seasons indicate that the three pair of Ferruginous Hawks within the study area have been subjected to a minimum of human disturbance. We found no evidence to suggest that human interference has in any way affected the production of these birds during the past two years. Two of the three pair of Ferruginous Hawks in the study area were successful during the 1990 breeding season. The third pair deserted during early incubation following

a very heavy snow storm. This desertion was from the same nest and under similar circumstances to the desertion in that territory the previous year.

It is of interest to note that our observations this season indicate this species can be extremely tolerant of some types of natural disturbance. One pair of Ferruginous Hawks decided to use an old nest less than 100 ft from a pair of already established Prairie Falcons. The same hill was occupied by two pair of Red-tailed Hawks (Buteo jamaicensis), a pair of Richardson's Merlins (Falco columbarius richardsoni), a pair of American Kestrel (Falco spaverius), and later a pair of Swainson's Hawks (Buteo swainsoni). The Ferruginous pair were subjected to virtually continuous aggression whenever one or both were flying near the hill. Despite this continual harassment the birds courted, mated and began incubation only to eventually desert during a very heavy spring snow storm.

In comparison to the previous year the incidence of disturbance to breeding pairs of Prairie Falcons was greatly reduced. Our observations suggest that six pair were subjected to, or affected by anything other than casual human disturbance. The degree of disturbance at three of the territories would be classed as moderate and our observations suggested that breeding behaviour appeared to be unaffected. Only two incidences of high disturbance were recorded and both pair successfully fledged four young. Clearly these birds had become habituated to river traffic and intense heavy equipment and vehicle activity (on some days up to

two heavy vehicles a minute passed beneath the one nest) and appeared to ignore the traffic which passed approximately one hundred feet below the nest site throughout the entire breeding season.

TABLE 6. PRODUCTIVITY AND DISTURBANCE AT KNOWN PRAIRIE FALCON BREEDING TERRITORIES FOR 1990

NEST SITE	1985 NEST #	PRODUCTIVE IN 1990	DISTURBANCE
Old Bridge	#48	Y	Moderate
Mercury	#45	Y	Severe
Dam[1]	#42	not occupied	
Buffalo Jump E.	#40	Y	Minimal
Buffalo Jump W.[2]		N	Minimal
Fairbrother		Y	Minimal
Bitango Eagle		Y	Severe
Bitango Bridge	#37	N	Moderate
Tennessee Creek		Y	Minimal
Lang		Y	Moderate
Welsch	#22	Y	Moderate
Days		relocated	Minimal
1st Porcupine[R]		Y	Minimal
Double Ox-bow	#18	not occupied	
Horseshoe Canyon	#15	Y	Minimal
Horseshoe Canyon[2]		Y	Minimal
Maloof	#12	Y	Minimal
Stevick		not occupied	Moderate
Castle Dairy		Y	Minimal

[1] suspected relocation from former #42

[2] second nest site within an established territory

[R] pair relocated from Days

NEST SITE = Names given to known breeding territories

= Corresponds to nest numbers given in earlier reports by Young

PRODUCTIVE = Indicates whether a nest site was productive or not in the 1990 breeding season.

DISTURBANCE = relative level of documented disturbance

At two of the four sites where disturbance was judged as moderate, the disturbance was limited to the activity of heavy equipment very early in the breeding cycle prior to active courtship and the pairs simply resumed normal breeding behaviour once the activity had ceased. In the remaining instance the majority of the activity was several hundred meters and across the river from the nest site. No unusual behaviour was noted even during periods when dust blanketed the area for many successive days. The pair appeared to be unaffected by the heavy equipment activity which continued in varying intensity throughout the breeding season. The pair courted, mated, laid eggs and incubated. However early in incubation the pair deserted following an unusually heavy rainstorm. The timing of the desertion suggest that the birds deserted as a result of the storm and examination of the nest site indicated that indeed it was exposed and in all probability the eggs would have been sitting in water.

A second Prairie Falcon nest was deserted when one of the two females stopped incubating in the Buffalo Jump territory. Similar behaviour and nest desertion was exhibited by the second female in this territory in the 1989 breeding season. Although two desertions were recorded at Prairie Falcon nest sites during the current breeding season neither could be attributed to human disturbance.

4.4 ARTIFICIAL NEST CONSTRUCTION

As indicated in the 1989 Raptor Mitigation Report many areas of suitable Prairie Falcon nesting habitat had been identified in the fall of 1988. For the most part this habitat was devoid of suitable

nest sites, however closer examination indicated that most of the cliffs could provide acceptable nest locations following some modification. It was also recognized that such modification would not only provide potential nest sites for the falcons but also for other cliff nesting raptors, geese, Common Ravens (Corvus corax) etc. (Fyfe and Armbruster, 1977). Initial attempts at modification were carried out in the winter of 88/89 and fifteen potential nest sites were constructed or modified prior to the 1989 breeding season.

Three of the fifteen artificial holes were occupied during the 1989 breeding season, one each by Ravens, Canada Geese and Prairie Falcons. Falcons were also observed investigating three of the other artificial nest holes in the study area. Of particular interest was the presence of a Peregrine falcon which was observed occupying one nest hole near the construction camp for about a week.

Throughout the breeding season all of the nest sites were checked and nest sites which could be improved by additional modification were noted. Although we felt that most of the existing artificial holes could be occupied, it was clear that several were a little larger than required and most could benefit from remodelling. Following improvement of existing sites, and construction or modification of other sites a combined total of forty seven potential nest sites were available prior to the 1990 breeding season. As indicated in the earlier report with the possible exception of the Bitango Bridge and Tennessee Creek territories,

suitable alternate nest sites were now available close to the existing sites which will be lost due to flooding.

Five artificial nest sites were occupied during the 1990 breeding season. Four of these sites(two Prairie Falcon, one Canada Goose and one Great-horned Owl) successfully fledged young and one site was occupied by a lone yearling male that was unable to attract a mate. Early in the breeding season Prairie Falcons were observed investigating two other artificial nest sites before finally selecting alternate sites.

In addition to the modification of ledges and the creation of nest holes for Prairie Falcons, boxes have been built which will be set out for Kestrels and other hole nesting species. Nineteen nest platforms were also constructed for placement on tree stumps in selected sites along the banks of the reservoir or on newly created islands(Appendix. 4).

As with the nest holes and nest boxes the platforms have the potential to provide nest sites for several species. They will not only provide potential nest sites for displaced Ferruginous and Red-tailed Hawks but may also be used by Canada Geese and may induce other birds of prey such as Osprey and Bald Eagle to nest in the area.

5.0 DISCUSSION

Fifteen territorial pair of Prairie Falcons and three territorial pair of Ferruginous Hawks were located in the study area during the

1990 breeding season. Production was good for both species despite the frequent adverse weather conditions. The mean fledging success of 3.85 young (Table 1) per successful pair of Prairie Falcons is exceptional. Normally good fledging success is in the order of 3.1 or 3.2 per successful pair as reported in Idaho by Ogden and Hornocker (1977) and the Pawnee Grassland in Colorado by Olendorff (1973).

As in 1989 the large number of breeding pairs together with the excellent production and high number of the successful pairs suggests an excellent food supply is readily available to these birds. I also believe that the documentation of two territories where single males each mated with two females is further evidence of an abundant food supply. To the best of my knowledge polygamy in this species has not been previously documented. Clearly it is a rare phenomena and probably will remain so since shared incubation and food gathering appears to be critical in the success of a breeding pair (Holthuijzen, 1989). It seems unlikely that a paired male would have the time to court, provide food and assist in the incubation and raising of a second nesting. This may well explain why the second female at Buffalo Jump has deserted her nesting attempt both years during incubation. Apparently the female involved in the second nesting at Horseshoe Canyon was more adaptable and presumably succeeded only because the male was able to provide sufficient food for the brood. I can only suggest that since food exchanges are important courtship behavioral patterns the ready availability of food contributed to the initial pairing with two mates.

In 1985 a single pair of Ferruginous hawks was recorded nesting in the area to be impacted by construction or future flooding. This pair has since relocated twice and is now occupying a site approximately four km from the dam site where they have nested successfully in both 1989 and 1990. Three other pairs of Ferruginous have been recorded within the arbitrary 16km distance I have used for the study area. Although none of these would have been subjected to disturbance associated with the construction of the dam, only one of these pair has successfully produced young both years. In both 1989 and 1990 one pair deserted due to unseasonably heavy snow storms and in 1989 one pair deserted the area without attempting to nest.

In the current year five young were produced at two nest sites located well outside of the proposed reservoir. We did not make a serious attempt to band these young as both nests were located some distance from the reservoir and because at the time of our visits the young had just recently fledged .

As in the previous year heavy snow and rain storms made field work difficult and at times impossible. This was particularly true when it came to our attempts at trapping and banding the Prairie Falcons in the study area. As a result we were only able to band and colour mark 47 of the 50 young falcons produced in the area. The young at the Bitango Eagle nest site were already fledged when we located the nest and we were only able to catch and mark two of them. As in 1989, trapping of the adults was hampered by unseasonably cold weather, and trapping was terminated rather than subject small

young or eggs to undue chilling. Consequently, we were only able to catch nine adults, in part due to conditions and in part due to the fact that we are now attempting to catch the less aggressive birds. In 1991 we propose to change our trapping technique and we will attempt to trap the remaining adults on the nest sites. Once again with better weather conditions every effort will be made in 1991 to trap the remaining breeding cohort.

All of the Prairie Falcons that were captured were ringed with standard USF&W bands and red, blue or black anodized bands to aid in field identification. The adults were again individually colour marked and the colour marking of the young was standardized for the year.

Whereas the two desertions which were documented in 1989 may have been attributed to disturbance, we have no evidence that would suggest the two desertions documented in the current year were related to human disturbance. One may have been related to adverse weather conditions and the second probably resulted from neglect of the male bird once incubation had been initiated. In contrast to last year where both sites were deserted very early in the breeding cycle, both of this years desertions occurred well into incubation at a time when prairie falcons normally are very tenacious.

The successful intervention and cooperation at the Welsch site is of particular interest in that the work was initiated at our request and carried out by the contractor to meet timing concerns relative to the welfare of this particular pair of birds.

Observations during the work indicated that the birds simply remained at the north edge of the cliffs during most of the reclamation and then returned to mate and nest successfully.

In the 1989 report I suggested that next to the actual destruction of nest sites by flooding, the most serious problem for both the Prairie Falcon and the Ferruginous Hawks would be the incredible amount of disturbance resulting from the construction of the dam and roads,as well as from clearing and other habitat modification. For both years the most remarkable aspect of the field observations has been the tolerance of the Prairie Falcons to the many types of disturbance. These birds frequently demonstrated tolerance levels to human activity far in excess to anything I had previously witnessed. The tolerance observed in the initial observations was further substantiated during this year's breeding effort. The extent of this tolerance is perhaps best illustrated by the success of one pair of falcons nesting directly over the road used for hauling fill to the dam. Trucks and heavy equipment passed within 50m below the nest, at times as frequently as 2 vehicles per minute.

After two years of field observations, the only desertions that we feel may have been associated with human disturbance were the two observed early in the breeding season in 1989. Both occurred at the onset of territorial occupancy and followed extended human activity. At both sites, people were observed walking about for several successive days within 10m to 100m of the base of the nesting cliff.

Our observations indicate that Prairie Falcons can be habituated to a wide variety of human activities and will tolerate incredible levels of disturbance. In fact with the exception of people actually walking around for extended periods of time in the immediate vicinity (50m+) of the nest sites, the Prairie Falcons tolerated or habituated to the majority of disturbances associated with the construction of the dam.

These observations parallel those made in the recent study in Idaho by Holthuijzen (1989). On the strength of these data I think that more realistic recommendations can be drafted relative to the potential effects of construction activities on breeding Prairie Falcons.

We do not have any comparable data for Ferruginous hawks and I therefore suggest that until shown otherwise the best approach with this species is that it be treated as ultra sensitive to human interference.

Five artificial sites were occupied this year, three by Prairie Falcons and one each by pairs of Canada Geese and Great-horned Owls. As noted in the last report, prior to the 1990 breeding season, suitable alternate nest sites were available for all of the pairs, the exception of those near the Bitango Bridge and along Tennessee Creek. Suitable nesting habitat is limited in or adjacent to these territories and additional investigations were made to select suitable cliffs for alternate sites. Suitable nesting habitat is limited within reasonable proximity of the three sites

that will be flooded in 1991. As there were no alternatives, marginal habitat was selected and with permission from the land owners, two new sites were created near Tennessee Creek and a third, south of the highway on a cliff adjacent to Pincher Creek. Together with the artificial sites immediately downstream of the Dam, suitable alternate sites are now available to the three pair that will be displaced by the initial flooding in 1991. Aside from the provision of alternate nest sites, the only contingency that must be met with the flooding of the dam is simply that every effort must be made to salvage the eggs and/or young from each of the nest sites that will be flooded. These eggs and/or young will then be transferred to other nesting falcons with eggs and/or young of the same age.

6.0 RECOMMENDATIONS

1. Where possible, it would be desirable to coordinate planned recreational activities to minimize disturbance and maximize the recreation and educational potential of the breeding raptors and colonial species.

2. Since it is proposed that the Dam will be flooded in two stages beginning in 1991 and completed in 1992 I recommend that the original recommendation relative to intensive field observations be extended to include 1992. This will be necessary so that complete observations relative to displacement and relocation can be carried out throughout the flooding of the dam. Funds permitting this would extend the field work for one additional year at which time it would be taken over by Fish and Wildlife.

3. Consideration should be given to a continuation of observations relative to the effect of recreational activities on birds of prey, colonial birds and other designated species for three to five years following the completion reservoir. (As stated in this report I believe we should be cognizant that following flooding of the reservoir the majority of the breeding pairs of prairie falcons and several other species will be subjected to increased interaction with humans. Because of the accumulated data on this population there is a unique opportunity to monitor the effects of disturbance in relation to increased recreational activities. Such monitoring

would help to understand habituation and would contribute to realistic guidelines for future projects relative to the effect of recreational activities on these species. I believe that such guidelines are going to be necessary for such projects in the future in light of the increased environmental concern by the public and environmental groups.

4. Consideration should be given to drafting more realistic recommendations relative to the effects of construction and related disturbance on Prairie Falcons. Our observations indicate that with a few exceptions, these birds are very tolerant of a wide variety of disturbances. Our findings support and parallel those made in the recent study in Idaho by Holthuijzen (1989). On the strength of these data, I think that realistic recommendations can be drafted relative to the potential effects of construction activities on breeding Prairie Falcons.

5. I recommend the establishment of an observation shelter and information board in one of the recreational areas or just opposite the Mercury site, where the public can observe the Prairie Falcons through spotting scopes. This should be manned by a summer student or retired biologist.

6. I recommend the establishment of information centres and/or displays in Pincher Creek, Cowley, and Public Lookout to inform the public of the raptor and wildlife mitigation work that is being carried out in association with the dam.

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8.0 ACKNOWLEDGEMENTS

I would like to acknowledge the assistance and contributions of Peter Harvey and Peter Charkiw in the banding, colour marking and nest hole construction; of my wife Lorraine as a field assistant and typist. I would also like to thank Ursuala Banasch of CWS for her assistance in providing historical nest data from CWS files and Dave Hay and Al Nilson for their patience and assistance in providing the support necessary to get the job done.

APPENDIX 1

NEST SITE RECORDS

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NEST SITE RECORDS

Prairie Falcons

Old Bridge Nest Site. #48(Young et al.,1986)

History

This is one of the original nest sites first documented in 1968 and monitored by CWS through the early 1980's. The nest was reported to be occupied in 1986 and 1987 (Young, 1988)

1990 Breeding Season

The female was first observed sitting in a tree opposite the cliff on March 6 and was observed at each visit to the site in March. On April 24 both birds were observed the male perched in the trees opposite the cliffs and the female in one of the improved nest ledges. She appears to be incubating. One or more birds were observed at pretty well every visit in May and one was always on the nest. June 5 the female was perched opposite and at least three 3wk-old yng were observed in the nest. On seeing me the female flew over and cacked. On June 18 four young were banded and both adults were trapped. The female was unbanded and the male was found to be the male that nested at Mercury in 1989.

Disturbance

Trucks and men walking at the river edge were observed early in March roughly 100m from the nest site and on the opposite side of the river. The activity apparently was limited to a couple of days merely setting up the pumping station. I did not observe the the backhoe. Men were observed rotovating straw into silt in the trees about 200M from the nest after the female was already incubating. They were there for three or four days and the female appeared to ignore them. Except for brief daily visits to check the pump there was little or no disturbance for the rest of the breeding season.

Results - 4 young fledged, both adults trapped

Mercury Nest Site - #45 (Young et al.,1986)

History

This is one of the original nest sites documented in 1968 and monitored by CWS through the early 1980's. It is named "Mercury" because this nest had the highest level of mercury contamination of any Prairie Falcon nest sites sampled in Alberta in 1968. The nest was reported to be occupied in 1986 and 1987 (Young, 1988).

1990 Breeding Season

A pair of birds on territory March 6 and observed repeatedly throughout the remainder of the breeding season. The female was first observed incubating on April 24 and still appeared to be brooding on June 11. Three young were banded June 21 and two were observed sitting in trees on July 11. The male was seldom observed at this site during the entire breeding season yet was present at banding and the young were successfully fledged.

Disturbance

As in previous years this pair is clearly habituated to the activity associated with the camp which is approximately 1km to the north on the opposite side of the river. They do not pay any attention to moving vehicles on the road a mere 150m away on the opposite side of the river, nor do they react to the presence or activity of the heavy equipment moving on or in association with the rock pile that is adjacent to the nest site. As in 1989 the first indication of disturbance was observed in April when fisheries biologists began working on the river in front of the nest. The birds were clearly agitated and flew overhead cacking continuously. However, the pair did not desert. It is possible that the repeated abscence of the male was due to his lack of tolerance for disturbance.

Results - 3 young fledged

Dam Nest Site - Powerline Site (CWS files); #42 (Young et al.,1986)

History

This is one of the original nest sites documented in 1970 and monitored by CWS through the early 1980's. The territory was reported to be occupied by a single adult in 1986. (Young,1986)

1990 Breeding season

Birds were not observed at or near this site at any time throughout the 1990 breeding season.

Disturbance

Although in 1989 this pair of birds appeared to be habituated to an incredible amount of disturbance including blasting less than 1km from the cliff, heavy equipment and trucks driving underneath the nest they were not observed at the site in 1990.

Result - No nesting attempted.

Buffalo Jump East Nest Site - Raven site(CWS files), #40(Young et al. 1986)

History

This is one of the original nest sites documented in 1968 and monitored by CWS through the early 1980's. The territory was reported to be occupied in 1986 and again in 1987.

1990 Breeding season

The pair were observed at this site on Feb 27 at the east end of the Buffalo Jump Cliff. The male was positively identified as last years male by the color band combination, the pair was observed copulating on April 17. The female was observed incubating on 24 and at the same time the same male was observed with a second female near the fence line. Male observed bringing food to five young in the nest on May 31. A female was perched near the fence line.

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with human. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - 5 young fledged

Buffalo Jump West Nest Site

History

This is a new nesting site and apparently results from the splitting of a long established territory at the Buffalo Jump Cliff. This male appears to be mating with two females.

1990 Breeding Season (no young produced)

A second female was first observed here on April 24. At the same time the oyher female was incubating at the east end of the cliff. The situation appeared to be the same as in 1989 except that we were able to identify the male as the same bird that had mated with the female in Buffalo Jump East. Courtship feeding,nest ledge behaviour and copulàtion were observed by the same male with both females. The female was flushed from the nest ledge on May 15 where she was apparently incubating. That was the last time she was observed and no eggs were found when the ledge was checked later.

Disturbance

Disturbance to this pair was minimal and other than our visits it is doubtful that these birds had any contact with humans. The nearest road is .7km to the southeast and the traffic does not seem to influence the pair at all.

Results - (no young produced)

Bitango Eagle Nest Site

History

This is a new nesting territory not know to have been occupied prior to the 1990 nesting season. The nest site is an old Golden Eagle nest on the side of a cliff about 1km south of the Bitango Bridge nest site.

1990 Breeding Season

Birds were first observed during courtship on April 5. Thought to be an alternate site for Bitango pair and not observed further once the Bitango pair were on eggs. We were next advised of the presence of these birds on June 23 by a trucker who saw them as he hauled fill along the road under the nest. We visited the nest on June 25, the adults were present and the young were already fledged. Two were caught and banded.

Results - (four young fledged)

Bitango Bridge Nest Site - #37 (Young et al.,1986)

History

This is a new nesting territory not occupied in the 1960's. The territory is first described by Young (Young et al.,1986)

1990 Breeding Season

The pair were first observed on territory Feb 27. Courtship and nest ledge behaviour observed on April 3 the female was identified as the same female as 89 by observing the color band combination. The female was observed incubating On May 15,17,23 and the male was observed sitting at the east end on one occasion. On May 31 the birds were gone. Clearly the nest was deserted, apparently due to the heavy rains of the previous few days. On later inspection, it was believed the nest was exposed and the eggs would have been sitting in water.

Disturbance

This pair were subjected to heavy equipment activity for most of the season, however there was no indication that the birds were disturbed. They courted, bred and nested despite the continuing long range disturbance. The pair did not appear to be affected by the activity or by the tremendous dust that was generated well into incubation.

Results - (nest desertion)

Tennessee Coulee Nest Site

History

This territory was first identified in 1989 when a female was flushed late in the breeding season. The condition of the nest site and the large accumulation of guano indicates that the territory is an old one with many years of occupancy. In 1990 the birds used a different site.

1990 Breeding Season

On April 5 a lone bird flew over the coulee at considerable height. I suspect this was the male. He was not aggressive and did not act territorial. When I returned on June 6th a female was heard cacking and was very territorial. This was an odd pair in that the female was very tame and the male exceedingly shy. The nest was not actually located until just prior to banding and was less than 100m from the Red-tail nest. The young could not be seen from below.

Disturbance

Disturbance at this site would be minimal.

Results- 4 young fledged, adult female caught and banded.

Lang Nest Site

History

This a new site first recorded in 1989 it is about 2km east of CWS Cowley site documented in 1968

1990 Breeding Season

First observed on March 26 with the male bringing food to last year's nest ledge. As in 1989, a second female was also at the site. Three birds were again observed at the site on April 5, after a brief encounter the second female left and one female remained and perched on the ground to the west of last years nest and began wailing. The Male flew by and lit in a small hole under the cliff edge. Nest ledge displays and courtship flying observed. On April 17 female observed incubating in the new nest hole. Young observed May 30. Five banded on June 21, adult male caught and banded on June 25.

Disturbance

Disturbance at this site would have been only moderate early in the breeding season. No birds were observed in the area at this time. Once the reclamation was complete we observed no outside disturbance and any disturbance would have been minimal.

Results - 5 young fledged, adult male caught and banded.

Welsch Nest Site - CWS Rapid Bend, #22 (Young et al. 1986)

History

This appears to have been CWS Rapid Bend site, however, severe slumping along the cliff face have drastically changed the cliff. In its present condition it was first described by Young as #22 in his report (Young et al. 1986) in 1985.

1990 Breeding Season

The pair were first observed at the site March 6 and as in 1989 both birds were observed on most visits to the site. Nest ledge displays were observed in late March and early April. During the few days when the caterpillar was doing land reclamation opposite the site, at each visit the female was observed sitting at the extreme north end of the cliffs. The female apparently was incubating by April 16 so that the disturbance in no way affected normal courtship and nesting. April 15. Although we were not able to catch the pair in 1990 the female was identified as last years female by her color band combination. Four young were banded on June 19.

Disturbance

At the beginning of the breeding season, disturbance was minimal prior to the reclamation of the gravel area in front of the nest cliff. This was carried out during the first week of April and the birds simply perched at the north end of the cliffs. As soon as the reclamation was complete, the birds moved back to the nest area and normal nesting continued. Disturbance following the reclamation would have been minimal.

Results - 4 young fledged

Day Nest Site

History

This is a new territory apparently occupied for the first time in 1989. A single bird was observed in this territory in 1988 and the pair were first observed in 1989 investigating a new artificial nest site. They chose a ledge about 50m to the north of the artificial nest hole.

1990 Breeding Season

Courtship flying observed on March 6 and one bird seen at the modified artificial nest site. Again on March 26 a female was observed at the nest site and was observed flying out into the valley and returning to it frequently. On April 3 a lone Prairie was observed hunting in the area then flying directly up to cliffs on 1st Porcupine. On checking, no falcons were observed at 1st Porcupine. Other than incidental sightings there was no further

indication of Prairie Falcon interest in the ledges at Day's in the 1990 breeding season.

Disturbance

Disturbance at this site was minimal throughout the nesting season.

Results - See 1st Porcupine.

1st Porcupine

History

This site was first documented in 1990. Two artificial nest sites were created on the cliff and a third very accessable natural site was present.

1990 Breeding Season

No Prairies were observed on these cliffs at our first visits in March and early April. Then following the observation of the male flying toward the cliff on April 3 and the desertion of the Day site a Prairie Falcon was observed patrolling the cliff. This bird was observed investigating one of the artificial sites and appeared to have chosen it as a site. On April 17th territorial behaviour was noted as a bird flew out from the natural nest site. At one point three prairies were in the air or investigating ledges on the cliff. Considerable aggression and the third bird was chased from the area. For the remainder of the breeding season there was considerable interaction with other species on the hill. Young were first observed on June 2nd and appeared to be at least 3 weeks of age. Five young were banded on June 18 and both adults were trapped. The male was last years male from Days and the female had been previously banded and may have been the female from Days as she was not caught in 1989.

Disturbance

Human related disturbance at this sight would be minimal.

Results - 5 young fledged

Double Ox-Bow Nest Site - # 18 (Young et al., 1986)

History

This territory was first described by Young (Young et al., 1986) and apparently was first located in 1985.

1990 Breeding Season

The site was unoccupied. Dispite frequent visits the only observation was of a single bird flying in front of the cliff and out of the valley on June 5.

Disturbance

Disturbance at this site would be minimal as it is very difficult to visit.

Results

Horseshoe Canyon Nest Site - #15 (Young et al.,1989)

History

This territory was first located in 1974 and was monitored by CWS crews until the early 1980's. It was next recorded by Young (Young et.al.,1986) and apparently was occupied by Prairie Falcons in 1985.

1990 Breeding Season

A single bird was observed flying out of the canyon and perching on the hill behind last years eyrie. This year the birds selected the old original site recorded by CWS in 1974. The nest clearly has been improved apparently by the CWS crews. A second female was flushed from a ledge about 100m to the south and was later found to be a second nesting female. The male was observed to be interacting with both females on two occasions and only one male was ever seen in the territory. On one visit, the female from the second nest was absent suggesting that she was perhaps out hunting.

Disturbance

Disturbance at this site would have been minimal.

Results - 4 young fledged from the north site. and 2 from the second site.

Horseshoe Canyon B Nest Site

History

This nest site was first located this year within 100m of the existing nest site.

1990 Breeding Season

A single bird was observed flying out of the canyon and perching on the hill behind last years eyrie. This year the birds selected the old original site recorded by CWS in 1974. The nest clearly has been improved apparently by the CWS crews. A second female was flushed from a ledge about 100m to the south and was later found to be a second nesting female. The male was observed to be interacting with both females on two occasions and only one male was ever seen in the territory. On one visit, the female from the second nest was absent suggesting that she was perhaps out hunting.

Disturbance

Disturbance at this site would have been minimal.

Results - 2 from the second site

Maloff Nest Site # 12 (Young et al.,1986)

History

This territory was reported to have been an historical Peregrine Falcon nesting territory, however, it was not occupied when checked in the 1960's and 1970's. This site was first recorded in 1974 by CWS and was monitored by them until the early 1980's. It was next described by Young (Young et.al.,1986) and apparently was occupied by Prairie Falcons in 1985.

1990 Breeding Season

A falcon was observed defending the territory against a Golden Eagle on Feb 27. Then a single bird was observed at the nest ledge on March 6. The pair were first observed on territory on March 26. One or both were present on every subsequent visit to the site. The female appeared to be incubating on May 21. Three young were produced and were banded on June 21. The two adults were trapped on June 27. The female for the first time, the male was the same bird banded at the site in 1989.

Disturbance

In 1990 the disturbance throughout the nesting season would have been minimal.

Result - 3 young fledged

Castle Dairy Nest Site

History

This is a new territory using artificial nest holes which had been constructed in 1988.

1990 Breeding Season

The pair were observed at the east end of the cliffs on March 6 and one or both birds was present on each subsequent visit to the area. By March 26 it was clear that they had selected a new nest hole at the east end. On April 16 the female appeared to be either laying or incubating. On May 30th the male was observed to bring food to the cliff, pluck it and then go to the nest hole and begin to feed small young. Four young were banded on June 20 and although we were not able to catch the adults we did get an opportunity to identify the male as the same bird as that banded in 1989.

Disturbance

This pair experienced minimal disturbance. There was much less activity than in 1989.

Results - 4 young fledged.

Fairbrother Nest Site

History

This is one of the original nest sites documented in the late 1968 and monitored by CWS through the early 1980's. This site was not included by Young (Young et al.,1986) presumably because it is approximately 3km from the construction area and will not be affected by either the construction or flooding. I have included it because of its relative proximity and the fact that there is considerable interaction between these birds and those that will be affected by the dam.

1990 Breeding Season

The pair were observed at the site on Feb 27 and birds were only seen infrequently prior to our visit in June. We were unsuccessful in trapping the adults on June 6 but were able to band the three young later in the month.

Disturbance

This pair would have be subjected to a minimal amount of disturbance by virtue of the sites relative inaccessibility.

Results - 3 young fledged.

APPENDIX 2

DATES OF FIRST SIGHTINGS OF MIGRANTS IN 1990

APPENDIX 2

DATES OF FIRST SIGHTING OF MIGRANTS IN 1990

Horned Lark *Eremophila alpestris*	- Feb 26
Prairie Falcon *Falco mexicanus*	26
Golden Eagle *Aquila chrysaetos*	27 *
Canada Goose *Branta canadensis*	- March 6
Common Flicker *Colaptes cafer*	17
American Robin *Turdus migratorius*	17
Killdeer *Charadrius vociferus*	26
Starling *Sturus vulgaris*	27
Red-tailed Hawk *Buteo jamaicensis*	- April 3
American Kestrel *Falco spaverius*	16
Northern Harrier *Circus cyaneus*	16
Western Meadowlark *Sturnella neglecta*	16
Richardson Merlin *Falco columbarius richardsoni*	17 *
Ferruginous Hawk *Buteo regalis*	17
Long-billed Curlew *Numenius americanus*	18
Belted Kingfisher *Ceryle alcyon*	19
Swainson Hawk *Buteo swainsoni*	24
Rough-legged Hawk *Buteo lagopus*	25
Great Blue Heron *Ardea herodias*	25
Sharp-shinned Hawk *Accipiter striatus*	30
Western Grebe *Aechmophorus occidentalis*	- May 1
Eared Grebe *Podiceps caspicus*	1
Wilson Phalarope *Steganopus tricolor*	1
Blue winged Teal *Anas discors*	1
Cinnamon Teal *Anas cyanoptera*	1
Gadwal *Anas strepera*	1

American Widgeon Mereca americana	1
Lesser Scaup Aythya affinis	1
Double-crested Cormorant Phalacrocorax auritus	15
Red-breasted Nuthatch Sitta canadensis	- June 6
Say's Phoebe Sayornis saya	6
Rock Wren Salpinctes obsoletus	6
Catbird Dumetella carolinensis	6
Western Wood Pewee Contopus sordidulus	6
Goldfinch Spinus tristis	6
House Wren Troglodytes aedon	7
Veery Hylocichla fuscescens	7
Cedar Waxwing Bomycilla cedrorum	7
Spotted Sandpiper Actitis macularia	12
Yellow Warbler Dendroica petechia	28
Ring-neck Duck Aythya collaris	- July 11
White Winged Scoter Melanitta deglandi	11
Ruddy Duck Oxyura jamaincensis	11
Clarke Nutcracker Nucifraga columbiana	11
Bank Swallow Riparia riparia	11

* Possibly winter resident or visitant

APPENDIX 3

BIRDS IDENTIFIED IN THE STUDY AREA 1989-90

APPENDIX 3

BIRDS IDENTIFIED IN THE STUDY AREA 1989-90

Western Grebe Aechmophorus occidentalis

Eared Grebe Podiceps caspicus

Double-crested Cormorant Phalacrocorax auritus

Great Blue Heron Ardea herodias

Whistling Swan Cygne siffleur

Canada Goose Branta canadensis

Snow Goose Chen hyperborea

Mallard Anas platyrhynchos

Gadwal Anas strepera

Northern Pintail Anus acuta

Green-winged Teal Anas carolinensis

Blue-winged Teal Anas discors

Cinnamon Teal Anas cyanoptera

American Widgeon Mereca americana

Shoveler Spatula clypeata

Wood Duck Aix sponsa

Ring-neck Duck Aythya collaris

Lesser Scaup Aythya affinis

White-winged Scoter Melanitta deglandi

Ruddy Duck Oxyura jamaincensis

Common Merganser Mergus merganser

Red-breasted Merganser Mergus serrator

Sharp-shinned Hawk Accipiter striatus

Cooper Hawk Accipiter cooperii

Goshawk Accipiter gentilis

Red-tailed Hawk Buteo jamaicensis

Swainson Hawk Buteo swainsoni

Rough-legged Hawk Buteo lagopus

Ferruginous Hawk Buteo regalis

Golden Eagle Aquila chrysaetos

Bald Eagle Haliaeetus leucocephalus

Northern Harrier Circus cyaneus

Osprey Pandion haliaetus

Prairie Falcon Falco mexicanus

Peregrine Falcon Falco peregrinus

Richardson's Merlin Falco columbarius richardsoni
American Kestrel Falco spaverius

Wilson Phalarope Steganopus tricolor

Killdeer Charadrius vociferus

Spotted Sandpiper Actitis macularia

Marbled Godwit Limosa fedoa

Willet Catoptrophorus semipalmatus

Long-billed Curlew Numenius americanus

California Gull Larus californicus

Ring-billed Gull Larus delawarensis

Mourning Dove Zenaida marcroura

Rock Dove Columa livia

Great Horned Owl Bubo virginianus

Common Nighthawk Chordeiles minor

Ruby-throated Hummingbird Archilochus colubris

Belted Kingfisher Ceryle alcyon

Common Flicker Colaptes cafer

Hairy Woodpecker Dendrocopos villosus24

Yellow-bellied Sapsucker Sphyrapicus varius

Eastern Kingbird Tyrannus tyrannus

Say's Phoebe Sayornis saya

Western Wood Pewee Contopus sordidulus

Horned Lark Eremophila alpestris

Northern Rough-winged Swallow Stelgidopteryx serripenn

Bank Swallow Riparia riparia

Barn Swallow Hirundo rustica

Cliff Swallow Petrochelidon pyrrhonota

Common Raven Corvus corax

Common Crow Corvus brachyrhynchos

Black-billed Magpie Pica pica

Gray Jay Perisoreus canadensis

Clarkes Nutcracker Nucifraga columbiana

Black-capped Chickadee Parus atricapillus

Red-breasted Nuthatch Sitta canadensis

Rock Wren Salpinctes obsoletus

House Wren Troglodytes aedon

Catbird Dumetella carolinensis

American Robin Turdus migratorius

Veery Hylocichla fuscescens

Mountain Bluebird Sialia currucoides

Ruby-crowned Kinglet Regulus calendula

Sprague's Pipit Anthus spragueii

Bohemian Waxwing Bombycilla garrulus

Cedar Waxwing Bomycilla cedrorum

Northern Shrike Lanius excubitor

Starling Sturus vulgaris

Yellow Warbler Dendroica petechia

Yellow-rumped Warbler Dendroica coronata

Red-winged Blackbird Agelaius phoeniceus

Brewers Blackbird Euphagus cyanocephalus

Western Meadowlark Sturnella neglecta

Common Grackel Quiscalus quiscula

Brown-headed Cowbird Molothrus ater

Pine Siskin Spinus pinus

American Goldfinch Spinus tristis

Vesper Sparrow Pooecetes gramineus

Savannah Sparrow Passerculus sandwichensis

APPENDIX 4

PROPOSED LOCATIONS FOR NEST POLES

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Watson Coulee

Pole suggested in the flat to the south of the dam.

Tennessee Coulee -

2nd Dam to North - one pole suggested to north further up the coulee.

Group Home -

One pole in the ditch at the bend of the road.

Delents

One pole just below the upper dam on a small flat in a bend

and one pole on the side of the second dam.

Welsch

Three poles on the island.

Horseshoe Canyon

Two poles on each of the three islands.

West of J Crossing Construction Bridge

Two poles on the island.

Stevick

Three poles on the island.

Total Poles suggested = nineteen

APPENDIX 5

DEFINITIONS OF TERMS USED IN REPORT

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Nesting Territory - The area around a nest site that is normally defended by the pair of birds in residence

Courtship Behaviour - Activities associated with pair formation including the following:

Courtship flying (flight displays)

Nest displays (individual and as pairs)

Nest selection (one of both birds of a pair)

Nest construction (in falcons the scraping a nest hollow)

Food exchanges (where the male brings food to the female)

Copulation or mating attempt

Alternate Nest - A suitable alternate nest site in or adjacent to a nesting territory that is available in the event of failure or loss of a nest site.

Artificial Nest - A man-made nest structure or nest hole that has been constructed specifically to provide suitable nest sites for resident breeding birds. In the context of this project artificial nest structures are being constructed for Prairie Falcons and Ferruginous Hawks and may be utilized by other raptors, geese or ravens.

Foraging Habitat - Habitat associated with a breeding territory that maintains an adequate abundance of accessible prey species.

Young Fledged - the young known to have successfully flown from a nest site.

Disturbance - disturbance is defined as something which disrupts or destroys the peace. In reference to breeding birds disturbance would be any activity which disrupts the breeding cycle. For the sake of discussion and comparison I have referred to disturbance as minimal, moderate, high and severe.

Minimal disturbance would include the incidental transgression of any predator, human,or vehicle into the territory of a breeding pair which may or may not elicit a territorial response. In such an instance, a pair would return to normal behaviour as soon as the transgression ceased.

Moderate disturbance would include frequent transgression of a predator, vehicle, activity or humans in the territory of a breeding pair but at a sufficient distance from the nest site would not constitute a threat.

High disturbance is excessive disturbance which in my opinion would normally result in the desertion of a nest site for a given breeding season but which are tolerated either as a result of habituation or because the activity occurred relatively late in the breeding cycle.

Severe disturbance includes any activity which is threatening early in the breeding cycle, in particular during courtship and nest site selection. Such disturbance is very likely to result in desertion of a nest site or even a nesting territory for that breeding season.

Habituation - "the waning of a response to a repeated activity" (Marler and Hamilton, 1966) or in this application,the ability of individuals or pairs of birds to accept disturbance as a result of increased exposure to an activity which does not harm or threaten the individual or pair.